



## Procedures and Guidelines

**DIRECTIVE NO.** 600-PG-8730.3.1A  
**EFFECTIVE DATE:** 08/26/1999  
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**APPROVED BY Signature:** *Original Signed By*  
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**TITLE:** Director of Space Sciences

**Responsible Office:** 600/Space Sciences Directorate

**Title:** Science Research

### P1. PURPOSE

The purpose of this Procedure/Guideline is to define the process of science research in the Space Sciences Directorate.

### P2. REFERENCES

- a. GPG 8730.3, The GSFC Quality Manual
- b. Visiting Committee Reports and Records

### P3. SCOPE

This procedure applies to all science research within the Space Sciences Directorate.

### P4. DEFINITIONS optional

### P5. AUTHORITIES AND RESPONSIBILITIES optional

### P6. CANCELLATION

600-PG-8730.3.1, Science Research Management

### P7. RECORDS

Quality Record Title	Record Custodian	Retention Period
Employee performance plan	M.A. Hartman	5 CFR 293.404 (a) (I) (i) 4 yrs.
List of published papers	M.A. Hartman	2 yrs.
Visiting committee reports	R. Dilling	5 yrs.
Memos for identifying extraordinary science expertise projects	M.A. Hartman	Life of project

### P8. IMPLEMENTATION

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Scientific research (in the limited context of space science at the Goddard Space Flight Center) involves the conception, development, fabrication, and operation of space science instruments, and the subsequent analysis of their data in the context of theoretical models. It also includes laboratory and field experimentation and theoretical modeling. The ultimate objective is the derivation of fundamental knowledge. By its very nature, scientific research is not amenable to detailed instruction, but is broadly guided by the scientific method. The scientific method is an integral part of advanced education in the physical sciences, so that peer review is the most appropriate mechanism to determine the extent to which research is being performed in accordance with its principles. The space science research process responds to national and Agency needs as determined by the space science community. Various opportunities are announced for competition publicly, as for example, through an Announcement of Opportunity (AO). Scientists propose for these opportunities and, if successful, are funded for the research.

Space science research can be categorized into four general areas.

In its colloquial definition, theoretical research or data analysis, it refers to research which is evaluated by external peers. This evaluation is done through peer reviewed papers and visiting committee reports. See Section P7. RECORDS above for the quality records list.

Internal research work in the laboratory or the field (balloons, sounding rockets) is used to develop new detectors or measurement techniques. Internal data analysis research is used to advance theories and confirm hypotheses, and often leads to value-added data products. These processes have no immediate external customer, nor are they amenable to strict process and/or design control because of the unknown nature of the results. The work, however, eventually leads to flight instruments or to better theoretical models.

The third category is the development of flight hardware done within the Directorate that is subject to all the GSFC QMS requirements.

The final category is the production of space flight instruments (whole or part) in which an extraordinary level of scientific expertise is necessary beyond which might be achieved by a conventional QMS. The quality of these products can only be assured by the experience, expertise, and personal involvement of eminent scientists who are recognized leaders in their respective fields of science. The QMS system is not sufficiently general to accommodate a fully documented replacement for the expertise of the scientist. These recognized experts validate the integrity and quality of the products. They assure the quality of the instruments so that the requirements of the proposal (customer agreement) will be met. The Director of Space Sciences will determine when these extraordinary conditions apply, and will issue a memo designating where this applies (Quality Record).

The validation of scientific research in the Space Sciences Directorate at the Goddard Space Flight Center requires an appreciation of two different (if not totally separate) aspects: "excellence" and "relevance." "Excellence" is measured primarily on an individual scientist basis. Scientists are held accountable by their supervisors in their performance plans each year to assure that science research results are published with sufficient frequency in peer-reviewed journals; progress is made on multi-year research projects; contributions are made to new proposals; and that the scientist is presenting results at national and/or international scientific meetings. On average, the goals are (1) Major participation in at

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least one refereed publication. Both internal and external reviews are applied here; no such publications are submitted without the approval of the supervisor (where the supervisor may require additional internal review before submission), and no such submitted papers are published without the approval of external reviewers. (2) Major contribution to a new business initiative (e.g., a proposal or laboratory development activity). Here, again, approval by supervisors (and, therefore, responsibility for quality) is required in advance of proposal submission. (3) A formal oral presentation of personal research to internal or external peers. In general, no formal records are kept of this presentation. The annual employee performance plan reflects the achievement of these specific goals or their equivalent.

"Relevance" is determined on the basis of consistency with the Center and agency strategic plans, and is best measured by continued institutional support. "Excellence" is also important in achieving such support, of course, but "relevance" is necessary. An independent opinion of both of these aspects of research is provided by regularly scheduled (annual to biennial) reviews by visiting committees. These visiting committees consist of respected members of the scientific community who are capable of assessing both how well we do our jobs (excellence) and the extent to which we are doing what the user community wants us to do (relevance). They use whatever standards they deem appropriate to measure our status, and to advise us on how to modify our approach to achieving and maintaining quality.

Generally, the end product of scientific research is the dissemination of derived knowledge to the scientific community through publication and/or presentation. Publications in refereed scientific journals comprise the principal products. Publication in non-refereed venues such as scientific conference proceedings and scientific reports constitute an additional set of products.

The quality record list of publications is kept by each division; updated no less frequently than annually. Since all publications are generally available in libraries and have unique reference numbers, it is not necessary for the divisions to keep copies of all publications. Copies of the Visiting Committee Reports are kept in the Directorate Office, and are available at the Directorate Home Page.

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### CHANGE HISTORY LOG

Revision	Effective Date	Description of Changes
Baseline	April 7, 1999	Initial Release
A	August 26, 1999	Broadened content to science research rather than science research management. Added a category that requires extraordinary science oversight for some instruments. Changed the format to correspond to the new PG format.

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